(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 October 2001 (04.10.2001)

PCT

(10) International Publication Number
WO 01/73372 A1

(51) International Patent Classification[7]: G01B 5/008, G05B 19/00, B23Q 35/04

(21) International Application Number: PCT/SE01/00643

(22) International Filing Date: 26 March 2001 (26.03.2001)

(25) Filing Language: Swedish

(26) Publication Language: English

(30) Priority Data:
0001042-1 24 March 2000 (24.03.2000) SE

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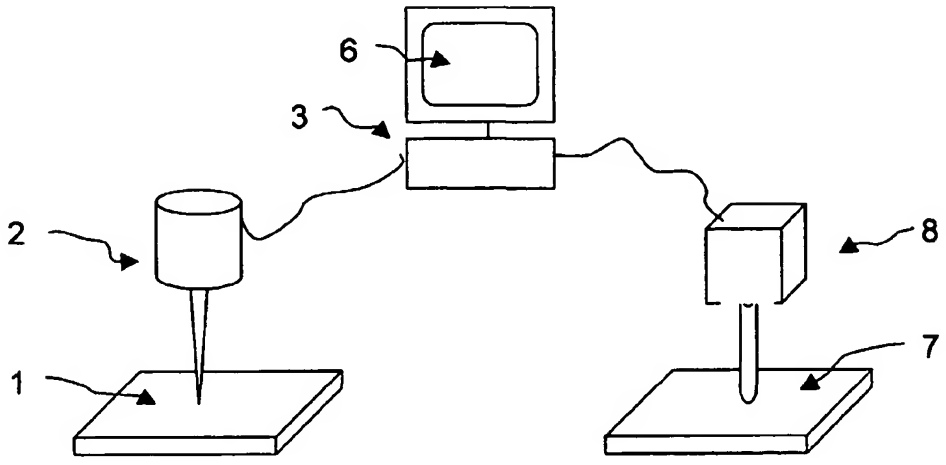
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD FOR PRODUCING A SURFACE TEXTURE



(57) Abstract: A method of producing a texture on a surface (7), according to which method a control signal, which comprises a texture description, is transmitted to machining equipment (8). The machining equipment (8) then creates a three-dimensional texture on a surface (7). The texture description of the control signal is produced by measurement of an existing surface (1) having a predetermined texture. The plane (10) of the surface is measured so as to be represented by several points and each point (11, 12) has a height relative to the plane (10) of the surface.

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METHOD FOR PRODUCING A SURFACE TEXTURE

Technical Field

The present invention relates to a method of producing a surface texture.

Technical Background

The surface of objects made from organic materials, for example from leather or wood, often produces a unique sensation to the touch or the eye. Largely, this is due to the topography and pattern of the surface, i.e. the surface texture.

In the manufacture of products of synthetic materials, such as plastics, the manufacturer often wishes to give his products surfaces possessing properties that either resemble those of natural materials or that impart to the products a particular functional quality, such as an improved or more comfortable grip. In the case of manufacture of e.g. synthetic-resin products, the compression-moulding tools are given a texture that is reproduced in the finished product. To manufacture a tool of this kind, conventionally a model of a soft material, such as clay, is made initially. Thereafter, the model is used to cast a product or a tool. This is a rather complex process, and in latter years some inventions have appeared that are based on the use of a tool, such as a milling cutter, which works on a surface in response to a control signal and thus imparts texture to the surface. The German Patent Specification DE 19 818 367, for instance, describes the use of a control signal for the manufacture of a leather-like surface on a product. In this case, the

control signal is composed in a computer from two different signals, one of which creates a cellular structure and the second one of which creates a coarser linear pattern, independently of the first one. When the computer by itself creates the control signal from an algorithm, only limited possibilities exist to control the result, i.e. to create individual surface structures in addition to those created by the algorithm.

Further, US 4 972 323 discloses a method according to which a picture is used as a pattern that is to be cut into a surface. A video camera is used to read the picture and enter it into a computer, the latter then using the grey-scale information of the digitalised picture to extract the picture outlines from such information. The extracted outlines are then cut into a surface by means of a milling cutter, a laser, a spark cutting machine or the like.

Each one of the above methods basically only creates artificial surface patterns that are cut, etched or in some other ways machined into the surface to a constant depth. One consequence of these methods is that the nature-like appearance and the quality of the texture thus produced are unsatisfactory. To obtain a more natural and life-like surface a three-dimensional texture is required.

Patent Specification FR 2 659 760 describes a method of producing a three-dimensional surface texture based on a scanned picture. The method is intended for use in conjunction with the manufacture of stamps used to produce watermarks on paper. A drawing or a photo is scanned and the grey-scale information is then used to build up a three-dimensional picture. The deeper the

impression in the paper, the darker the shade of the watermark.

One problem encountered with the method according to FR 2 659 760 is that the texture it produces is based on a scanned picture or drawing. The grey-scale information, forming the basis of the texture produced, largely depends on the direction of the source of light towards the object of the picture. In addition, the angle of reproduction is of considerable importance to the contents of the scanned texture description. If this method were to be used to impart a particular surface texture to products the result would be that the texture thus produced would depend largely on the conditions prevailing in the course of reproducing the existing structure. Another problem is that then one and the same texture could be described in different ways. Anyone having only these descriptions at his disposal would experience difficulties in determining whether they actually describe the same texture.

In order to define the texture of an artificially produced surface, industrial manufacturers traditionally rely on reference objects and visual assessments of the finished results. Within the automobile industry, for example, various interior-fitting components intended to be assembled into one single unit, usually are produced by different manufacturers. It is therefore difficult for the purchaser to provide his suppliers with a /an exact/ specification of the texture of the components, and in turn for the various suppliers to manufacture products of identical texture.

Summary of the Invention

The object of the invention is to provide a method allowing a description of texture to be created based on the texture of an existing surface, and a new texture to be produced based on that description. This object is obtained by means of a method defined in the appended claims.

The invention offers numeral advantages, some of which will be mentioned herein. For example, the invention makes it possible to create an unambiguous description of texture for the specification, manufacture and quality control of a texture. The invention likewise makes it easier to introduce new textures for various products and to visualise them in a computer environment.

Brief Description of the Drawings

The invention will be described in more detail in the following for exemplifying purposes by means of one embodiment and with reference to the accompanying drawings, wherein

Fig 1 is a view of a device for measuring, storing and producing textures,

Fig 2 illustrates composite texture descriptions,

Fig 3 illustrates the layered structure of a texture description,

Fig 4 illustrates a distributed method in accordance with the invention,

Fig 5 illustrates how two texture descriptions may be united to form one new texture description, and

Fig 6 illustrates possible changes of the visual impression of a surface.

Detailed Description of Preferred Embodiments

The method in accordance with the invention is designed to measure the texture of an existing surface 1, to store the texture data in a library of textures and to generate a control signal which is forwarded to a machining apparatus 8 devised to create a new texture 7. The texture of an existing surface 1 is measured by means of a surface-topography measuring instrument 2, such as a sliding-needle meter or a white-light interferometer. The measurements are taken so as to ensure that the surface will be represented by a large number of points in some kind of coordinate system, and preferably the number of points, i.e. the accuracy of detail, is determined by the user. A suitable system of coordinates is the Cartesian coordinates, wherein the X and Y axes define the location of a point in the plane of the surface and the Z axis the vertical height of the measuring point. The number of measuring points is determined by the user. The measuring instrument 2 is coupled to a processing unit, which could be a computer 3. Before the data is processed, it preferably is stored in a computer file as non-filtered measurement data on a storage medium of some kind. If a computer 3 is used as the processing unit, the routines of the computer preferably are software-implemented. The software enables the user to machine the scanned texture. The description could, for example, be scaled laterally and vertically to increase or reduce the spacing between the points. It is likewise possible to increase or reduce the number of points by means of linear or spline interpolation.

By changing the relation between the heights of the points it becomes possible to alter both the sensual feel upon touch and the visual impression, as is exemplified in Fig 6. For instance, it is possible to reduce the

relative heights of the points to thus produce a smoother surface. In the same manner it becomes possible to increase the differences in height between the points to produce a coarser surface, thus improving e.g. the grip of the latter, for example. As already mentioned, the relative heights of the points of the texture also are of decisive importance for the visual impression. By altering the mutual relations it becomes possible to affect the degree of shine or matt finish of a surface and how the colour of the surface is perceived.

The computer 3 preferably also contains software that is able to adapt the scanned texture in a manner making it possible to create a larger pattern by placing several descriptions 4 in adjoining relationship without the borders 5 being visible, so called stitching, as shown in Fig 2. The stitching method involves some adaptation of those edges of the scanned texture that form the borders 5 adjoining similarly scanned textures 4. Such adaptation could for instance be levelling of the point heights in the border areas to heights approaching the heights of the neighbouring points. Alternatively, the area surrounding each point could also be adapted such that the slope of a surface continues across the borders 5 between the textured elements 4. Such a stitched texture description need not necessarily be rectangular but triangular or hexagonal shapes are equally possible.

After each change, the texture description may be stored in a library of textures in a standardised size. To store a number of textures in a library offers several advantages. A library containing different texture descriptions, stored in the same size, makes it easier to introduce new textures intended for products, to

visualise and to choose between different textures and to exchange texture descriptions between different systems. Likewise, it becomes possible for several actors to use the library of textures as a common master, which may be used for specification, production and quality control. This is highly advantageous, when several subcontractors manufacture different components that are to have an identical surface texture and that are to be assembled into one single product. By using identical texture descriptions, the risks for disparity, for instance as regards as smoothness and glossiness, in the surface texture of the components, are partly or completely eliminated.

Preferably, the software also allows different visualisations of the measured textures or the stored texture descriptions to be made. At any time of the user's choice, the stored texture descriptions may be retrieved from the library of textures. A preview of the appearance of the future texture 7 to be produced may be displayed on a screen 6, which is coupled to the computer 3. A preferred visualisation is a three-dimensional representation of the texture as seen in a perspective view. The machining operations being performed on the scanned texture can then also be shown on the screen 6. Further, a number of different modifications or different texture descriptions may be shown simultaneously. Preferably, the textures may be viewed from different angles, in different light settings, different colours and in lights of different intensity. In accordance with the preferred embodiment, an optional cross-sectional view of the topography of the surface may be shown.

In accordance with a preferred embodiment of the invention, two or more texture descriptions may be

retrieved from the library of textures to be combined into one novel texture, as shown in Fig 5. By constructing novel textures from two or several texture descriptions it becomes possible to create surfaces having novel and preferably unique textures not found in existing materials. In addition, it then becomes possible to add the functional qualities of one surface to the appearance of another; for example, a wavy and glossy surface may be combined with a flat and rough surface in order to produce a wavy and rough surface. It may sometimes be desired to subject the texture to adaptive measures before the textures are combined. For example, if the amounts of points for a predetermined surface area differ, it may be necessary to increase or reduced the amount of points of one or both texture descriptions. Some of the methods described above of machining a measured texture may also be applied prior to the combination of texture descriptions. The textures may be combined in a variety of different ways, the combination being effected by means of a mathematical operation, such as addition, subtraction, multiplication, maximum, minimum, and so forth. It is then possible to store the combined structure as a novel texture in the library of textures.

From the computer 3, a texture description may also be exported to a CAD programme. In the CAD programme, the texture may then be applied on a product. It is likewise possible to illustrate or distribute a texture description either as a computer file or as a graphic representation via a network, such as the Internet, to a client, which could be a web-browser.

It is likewise desirable to be able to distribute the method in accordance with the invention, as shown in

Fig 4. In this case, existing surfaces may be measured on various locations and the measurements be collected in a library of textures. With the aid of a web-browser or the like the user will be able to view the various textures via the Internet. It is likewise desirable that the user is able to combine or in other ways work on the textures directly in the browser. In a distributive method, the manufacture may take place elsewhere. The texture chosen by the user may then be forwarded to a system that creates a control signal for control of a manufacturing process. In addition, the producing unit may be located on one other place. In the same manner the customer for example or an independent institute could check the quality of the manufactured texture and compare it with the texture description in the library of textures. In accordance with a preferred embodiment a customer sends a measured texture to another actor in the network. Alternatively, the customer could instead choose a texture straight from a library of already measured textures on e.g. the actor's home page on the Internet. After having send or chosen and possibly also adapted a texture, the customer commissions the actor to produce a control signal, which is then returned to the customer as a computer file. In order to authenticate authorised access to the actor's library or authority to transmit measured textures, a log-in method may be used, for instance in the form of an extranet.

The computer 3 generates the control signal that is transmitted to the machining equipment 8. The control signal is generated in that the measured and processed amount of points alternatively a texture description from the library of textures is layered in a number of layers 9 as shown schematically in Fig 3. The layers 9 extend in

parallel with the plane 10 of the surface and the uppermost layer is level with or extends above the highest point of the texture and the lowermost layer is below or level with the lowermost point of the texture. In any one layer 9 some points 11 therefore will be positioned above the layer and some points 12 below the layer 9. If layer 9 is compared to the sea level, some points 11 will form islands extending above the sea level and some points 12 will be located below the sea level. In each layer 9 each point 11 the height of which exceeds the height of the layer will have one value whereas other points 12 will have another value, which values could be for example 0 and 1, respectively. Other ways may exist to ascribe values to the points, for example a scale comprising more steps than 0 and 1 may be used. Still the values 0 and 1 could be reversed, such that the points the height of which exceeds the height of the layer could be ascribed the value 0 and vice versa. It may likewise be possible to compose the control signal by giving to each layer a predetermined thickness and attributing to the points a value indicating to which layer they belong.

The control signal produced as indicated above, i.e. containing data on the point heights relative to the heights of the different layers, is then transmitted to a machining apparatus 8. The apparatus 8 machines a surface 7 for production of a novel texture and uses the control signal to mask the areas that should be left unaffected, i.e. areas containing points 11 of value 1. Other parts of the surface are subjected to a treatment, for example to chemical etching, whereby these areas will be depressed. Alternatively, this effect could be achieved also by means of material removing techniques, such as milling, chemical treatments or erosive treatments, such

as sparking. The process is repeated with respect to each layer 9, sequentially from the uppermost to the lowermost. The larger the number of layers 9 that the control signal comprises, the more accurate will be the texture 7 as produced, particularly in the case of wavy textures. Depending on whether the texture 7 is to be a negative or a positive image/representation of the measured texture 1, the areas to be removed could simply be exchanged for those that are masked.

It is likewise possible to export a picture of each layer wherein the different areas are represented by black and white fields, respectively.

Once a novel texture 7 has been produced, it preferably is subjected to a quality check. Most simply, this is effected by measuring the produced texture by using the same measuring equipment 2 as the one above. The produced texture 7 is then compared either with a measured texture 1 or with a texture from the library.

It easily understood that numerous modifications of the embodiment of the invention described above are possible within the scope of the invention. For instance, software need not necessarily be the means designed to process the measured texture but this function could equally well be implemented in the hardware. The points that are measured could be unevenly distributed across the surface. Still the control signal could be designed to correspond to the tool paths in a multi-function machine comprising e.g. a milling tool.

CLAIMS

1. A method of producing a texture on a surface (7), comprising the steps

of transmitting a control signal, comprising a texture description, to machining equipment (8), and

of creating, by means of said machining equipment (8), a three-dimensional texture on a surface (7), said method being c h a r a c t e r i s e d in that it further comprises the steps

of forming the texture description of said control signal by measuring an existing surface (1) having a predetermined texture, and

of measuring said surface (1) in such a manner that the plane of the surface is represented by several points and of to each point assigning a height relative to the plane of the surface.

2. A method as claimed in claim 1, further comprising the steps

of arranging the measured plurality of points in at least two layers (9), and

of giving said control signal a corresponding layer distribution for repetitive machining of the surface layer by layer.

3. A method as claimed in claim 2, wherein the steps of arranging the texture description in at least two different layers (9) is effected to ensure that they extend in parallel with the plane (10) of the surface, the uppermost layer (9) being level with or extending above the highest point of the texture and the lowermost layer extending below or being level with the lowest point of the texture, said method further comprising the steps

of comparing, for each layer (9) the height of each point with the height of the layer, and

of giving to each point a value defining the height of the point relative to the height of the layer, such as information as to whether the height of the point is positioned above or below the height of the layer.

4. A method as claimed in claim 3, wherein said machining equipment (8) creates a three-dimensional texture on a surface (7) by

repeatedly machining the surface (7) in order to deepen, for each layer (9) of the control signal, in order from the uppermost to the lowermost, the areas that are formed by the points (11, 12) located on one side of the layer.

5. A method as claimed in any one of the preceding claims, wherein the manufacturing precision is measured in that the method further comprises the steps

of measuring the produced texture (7) by the same method as the one used for measuring the original, existing texture (1), and

of comparing the results from the measuring process with the texture description based on which the texture is produced.

6. A method as claimed in any one of the preceding claims, said method further comprising the step

of changing the spacing between the points in the texture description at least in a direction for altering the visual or tactile impression of the produced texture (7), for instance its gloss, the perception of its colour or its smoothness.

7. A method as claimed in any one of the preceding claims, said method further comprising the step

of increasing the amount of points of the texture description by approximation of intermediate points by means of interpolation.

8. A method as claimed in any one of claims 1-6, said method further comprising the steps

of reducing the amounts of points of the texture description, and

of approximating replacement points by means of interpolation.

9. A method as claimed in any one of the preceding claims, said method further comprising the step

of storing the texture description in a storage medium to make it readable at a later occasion.

10. A method as claimed in any one of the preceding claims, said method further comprising the step

of combining different texture descriptions into a novel texture description by means of a mathematical operation effected with respect to at least part of the point heights of said different texture descriptions, such as addition or subtraction

11. A method as claimed in any one of the preceding claims, said method further comprising the step

of presenting the texture description in graphic form on a screen (6) in order to provide a preview of the texture to be produced, such as applying a texture on a three-dimensional object.

12. A method as claimed in any one of the preceding claims, wherein the various steps are effected distributed over a number of units in some kind of network, such as the Internet.

13. A method as claimed in claim 12, wherein the step of measuring an existing surface is effected in one unit, the step of forming a control signal is effected in

one unit, and the step of creating a novel texture is effected in another unit.

14. A method as claimed in any one of claims 1-13, wherein the machining equipment (8) deepens areas of the surface by means of removing techniques, such as milling.

15. A method as claimed in any one of claims 1-13, wherein the machining equipment (8) deepens areas of the surface by means of erosion techniques, such as sparking.

16. A method as claimed in any one of claims 1-13, wherein the machining equipment (8) deepens areas of the surface by means of chemical reactions, such as etching.

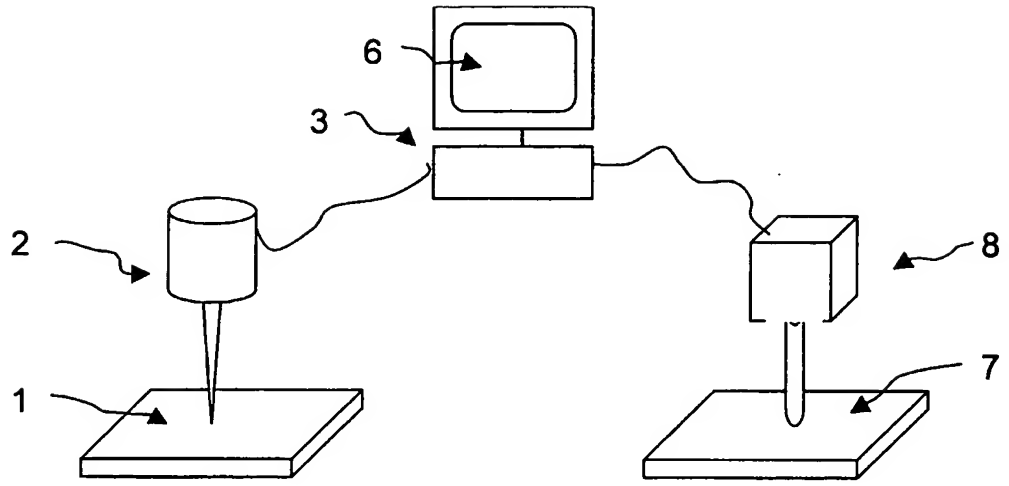

Fig. 1

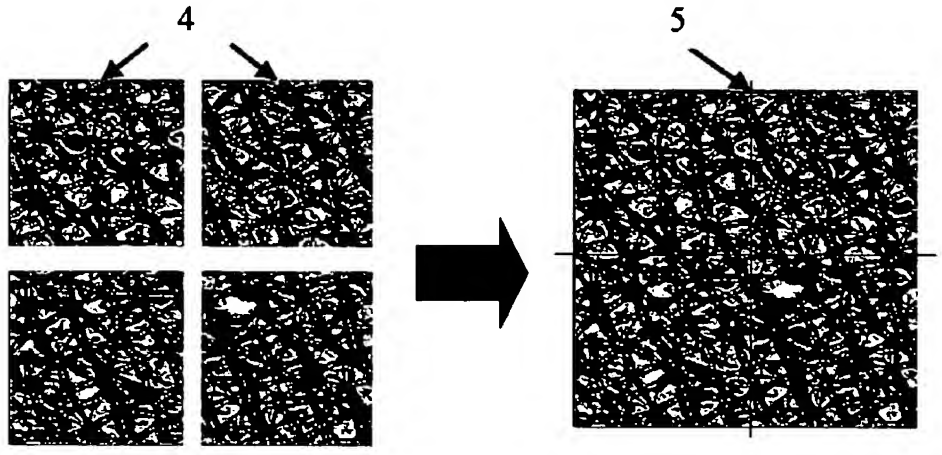

Fig. 2

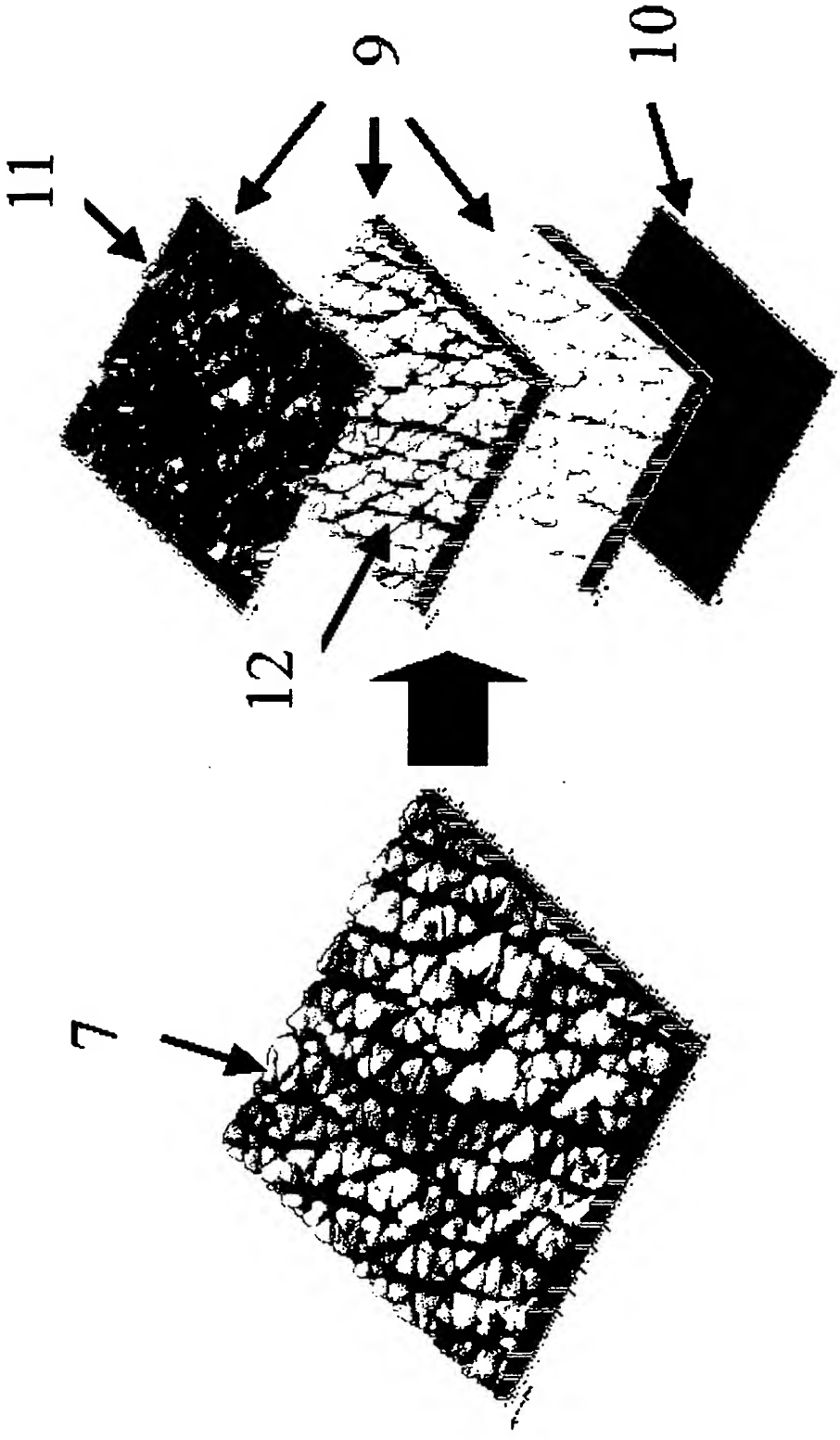

Fig. 3

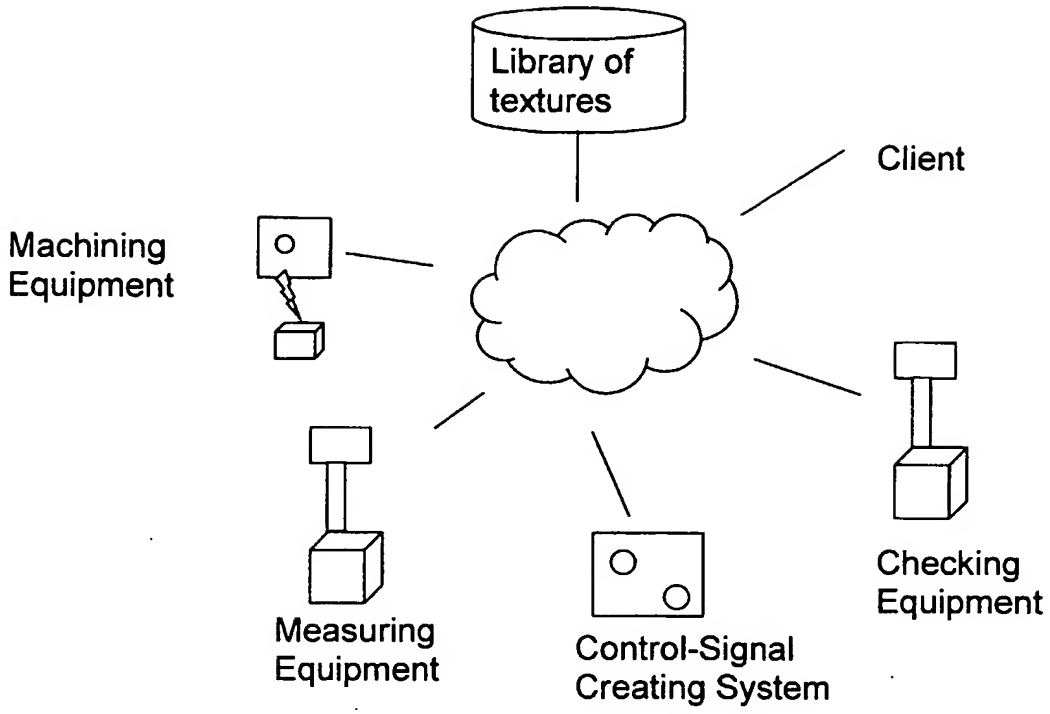

Fig. 4

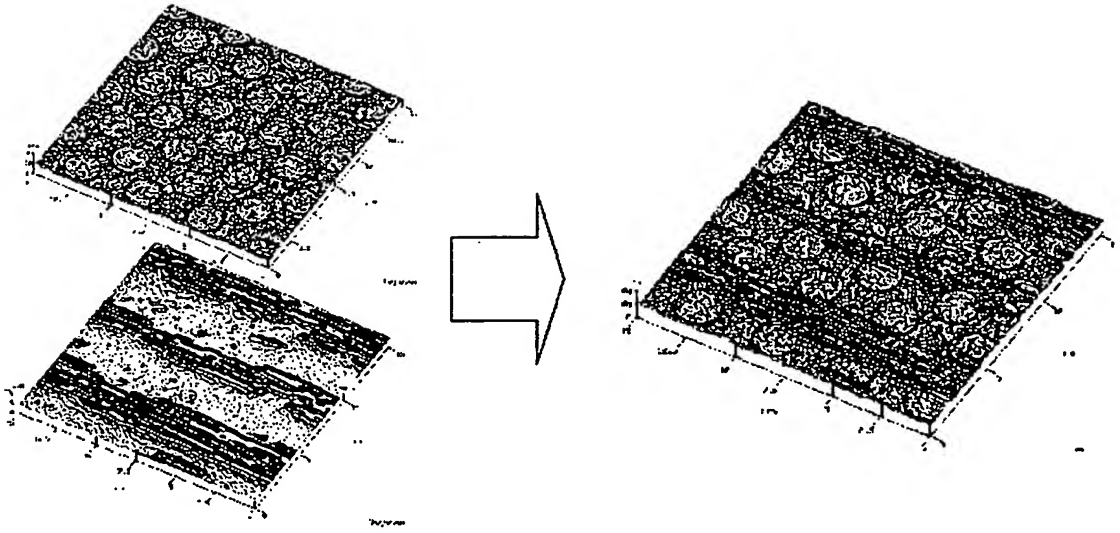

Fig. 5

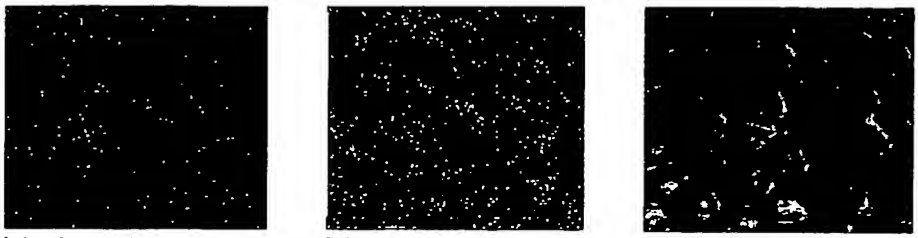

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/00643

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G01B 5/008, G05B 19/00, B23Q 35/04
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G01B, G05B, B23Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5454422 A (S. KITAGAWA), 3 October 1995 (03.10.95)	1-16
	--	
Y	US 5003484 A (N. VOLLMAYR), 26 March 1991 (26.03.91)	1-16
	--	
Y	DE 3817454 A1 (DR. JOHANNES HEIDENHAIN GMBH), 30 November 1989 (30.11.89)	1-16
	--	
Y	US 5432704 A (F.A. VOUZELAUD ET AL), 11 July 1995 (11.07.95)	1-16
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
12 June 2001	19 -06- 2001
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/00643

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3677136 A (A. GIROLA), 18 July 1972 (18.07.72)	1-16
	--	
Y	US 3684873 A (J. MEYER ET AL), 15 August 1972 (15.08.72)	1-16
	--	
Y	US 4866631 A (T. KURAGANO ET AL), 12 Sept 1989 (12.09.89)	1-16
	--	
Y	GB 2296788 A (STONEMATE LTD), 10 July 1996 (10.07.96)	1-16
	--	
Y	US 5116174 A (K. FRIED ET AL), 26 May 1992 (26.05.92)	1-16
	--	
A	US 4972323 A (C.M. CAUWET), 20 November 1990 (20.11.90)	
	--	
A	FR 2659760 A1 (ARJOMARI-PRIOUX), 20 Sept 1991 (20.09.91)	
	--	
A	DE 19618367 A1 (BENECKE-KALIKO AG), 13 November 1997 (13.11.97)	
	--	

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/05/01

International application No.
PCT/SE 01/00643

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5454422 A	03/10/95	NONE	
US 5003484 A	26/03/91	DE 3804743 A,C	24/08/89
		DE 3886731 D	00/00/00
		DE 8816754 U	05/07/90
		EP 0328750 A,B	23/08/89
		JP 1246046 A	02/10/89
		JP 2588603 B	05/03/97
DE 3817454 A1	30/11/89	DE 58905016 D	00/00/00
		EP 0343386 A,B	29/11/89
US 5432704 A	11/07/95	NONE	
US 3677136 A	18/07/72	NONE	
US 3684873 A	15/08/72	NONE	
US 4866631 A	12/09/89	AU 611101 B	06/06/91
		AU 640463 B	26/08/93
		AU 7292291 A	18/07/91
		AU 7996187 A	28/04/88
		CA 1282142 A	26/03/91
		EP 0264919 A	27/04/88
		JP 2513209 B	03/07/96
		JP 63217405 A	09/09/88
		JP 63104182 A	09/05/88
GB 2296788 A	10/07/96	GB 9524282 D	00/00/00
US 5116174 A	26/05/92	NONE	
US 4972323 A	20/11/90	EP 0273826 A	06/07/88
		FR 2608797 A,B	24/06/88

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/05/01

International application No.
PCT/SE 01/00643

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2659760 A1	20/09/91	AT 114063 T	15/11/94
		BR 9106144 A	09/03/93
		DE 69105122 D,T	06/04/95
		EP 0520025 A,B	30/12/92
		SE 0520025 T3	
		ES 2067224 T	16/03/95
		US 5486928 A	23/01/96
		WO 9114217 A	19/09/91
DE 19618367 A1	13/11/97	JP 10124112 A	15/05/98